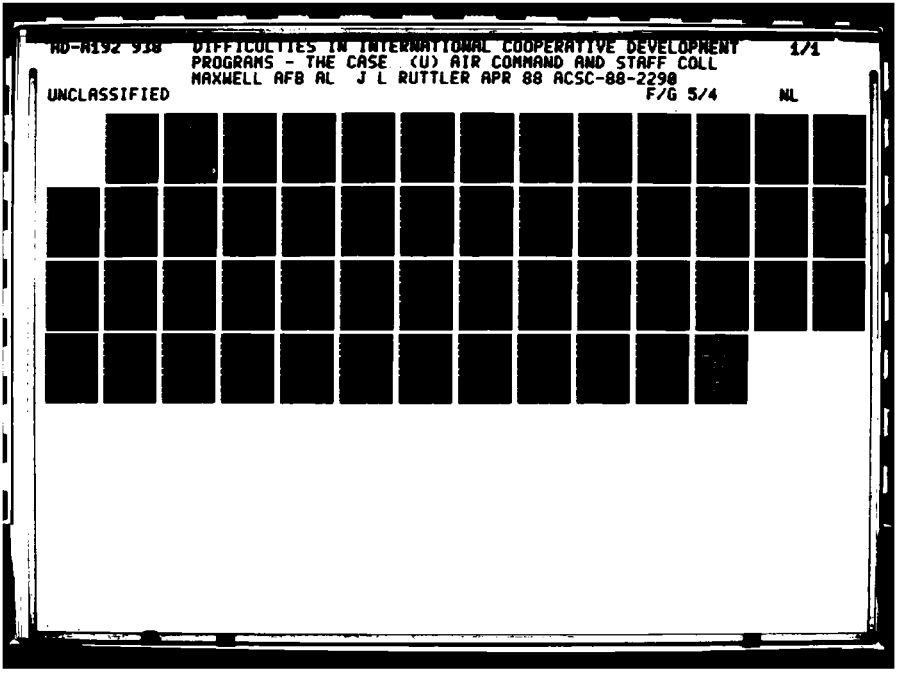
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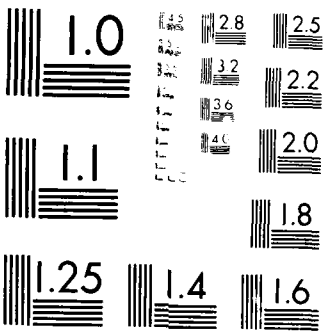
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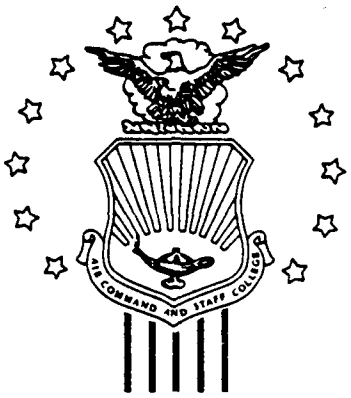

AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

DIFFICULTIES IN INTERNATIONAL COOPERATIVE DEVELOPMENT PROGRAMS--
THE CASE OF US-UK
AIR-TO-SURFACE WEAPONS SYSTEMS

MAJOR JAMES L. RUTTLER JR. #88-2290

"insights into tomorrow"

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TITLE DIFFICULTIES IN INTERNATIONAL COOPERATIVE DEVELOPMENT PROGRAMS--THE CASE OF US-UK AIR-TO-SURFACE WEAPONS SYSTEMS

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International cooperative development programs are a possible solution to NATO's problem of increasing conventional capability within limited defense budgets. Pooling development resources and increasing production quantities would make future weapons systems more affordable for all alliance members. With all the potential benefits, why has progress on cooperative development programs been so slow? This analysis seeks to identify impediments to successful international cooperative development and make recommendations to facilitate US participation. The study concludes that the problems are not insurmountable, but they require management by senior government officials in each participating country.

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PREFACE

International cooperative development, as used herein, is the term that describes the process whereby two or more nations join together in some manner to build a new system to be used by each of the participating nations. The participant nations pool resources; e.g. money, manpower, technology, and management expertise, to gain leverage on the development process. The potential benefits include lower development costs for each nation when measured against development cost for a national program, lower unit cost gained through economies of scale during full-rate production, and increased interoperability between the military forces of the participating nations.

With the potential benefits just outlined, why is cooperation so difficult? This study seeks to answer the question in at least a limited sense. The scope of analysis was limited to bilateral cooperation between the US and the UK on tactical air-to-surface weapons systems. It is felt that problems identified in this limited example may be generalized to other cases involving different countries and different types of weapons systems; however, further study is required. I would like to thank Mr. Steve Adams, ANSER Corporation, and Major Alan Schoolcraft, Air Command and Staff College, for their help in the preparation of this analysis.

ABOUT THE AUTHOR

Major Jim Ruttler received his commission in June 1975 through the US Air Force Academy. After graduating from Undergraduate Pilot Training, he was assigned to Luke AFB, AZ where he qualified in the F-4. Major Ruttler has flown the F-4 at Nellis AFB, NV; Kunsan AB, ROK; and Clark AB, RP. He completed the USAF F-4 Fighter Weapons Instructor Course in 1981, and has 1300 hours of fighter experience in the F-4 C/D/E/G and ARN-101 F-4E. In 1982, he was assigned to Hq PACAF where he performed duties as an F-4 Operations Inspector for the PACAF Inspector General. Major Ruttler was then assigned to Hq USAF where he worked as Chief of Air-to-Surface (A/S) Weapons Requirements, Tactical Weapons Division, Directorate of Operational Requirements, DCS Research and Development.

Among other duties at the Pentagon, Major Ruttler was the Program Element Monitor for the Modular Stand-off Weapons (MSOW) Program, a seven nation cooperative development program to develop a tactical, stand-off, A/S weapon. In this capacity, he was involved in every facet of the MSOW program from its inception to the signing of the international memorandum of understanding. In particular, he drafted and coordinated the MSOW NATO Staff Requirement, a seven nation requirements document; wrote the US document governing technology transfer to the MSOW program; coordinated on the MSOW acquisition strategy; and worked MSOW funding issues.

Major Ruttler holds a Bachelor of Science degree in Electrical Engineering from the US Air Force Academy and a Master of Science degree in Systems Management from the University of Southern California. Major Ruttler has completed Squadron Officers School, Air Command and Staff College, and the National Security Management nonresident courses. He is presently assigned to the Air University as a course officer in the Air Command and Staff College.

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REPORT NUMBER 88-2290

AUTHOR(S) MAJOR JAMES L. RUTTLER JR., USAF

TITLE DIFFICULTIES IN INTERNATIONAL COOPERATIVE DEVELOPMENT PROGRAMS--THE CASE OF US-UK AIR-TO-SURFACE WEAPONS SYSTEMS

I. Purpose: This analysis seeks to identify impediments to successful international cooperative weapons development and make recommendations to facilitate US participation in cooperative development programs.

II. Problem: With the signing of the Intermediate-range Nuclear Forces (INF) Treaty, NATO's conventional forces are receiving greater attention. Cooperative development programs offer one solution to the problem of increasing conventional capability with limited defense budgets. Pooling development resources and increasing production quantities should make future weapons systems more affordable for all alliance members. With all the potential benefits, why do NATO allies find it so hard to cooperate?

III. Data: US and UK development procedures for tactical air-to-surface (A/S) weapons were compared to identify barriers to successful cooperative development. Four areas were analyzed; operational requirements, technology transfer, acquisition processes, and program funding. Operational requirements are

crucial to development programs because they define the capability which the new weapons system is designed to meet. The user/developer team is required to make trade-off decisions to best meet the requirement with limited resources. Differences between the USAF and the RAF make these trade-off decisions difficult. Technology transfer policy is important to successful cooperative development because it could affect technology availability, and different tech transfer policies may cause friction between the cooperating parties. In general, the US has a more restrictive technology transfer policy than does the UK. Bilateral programs must adapt to the acquisition processes of the two countries. Phase point mismatch and differences in phase content make it difficult for the international program to interface with the management structures of the two countries. In addition, differences in the size of the defense budget and the industrial base between the two countries significantly affect cooperative development programs. Cooperative programs must compete for funding in both the UK and the US. International programs are at a disadvantage when competing against national programs, especially in the US, because industrial and military service support is diluted. Therefore, decision makers must be knowledgeable of the costs and benefits of cooperative development.

IV. CONCLUSIONS: There are institutional differences in the weapons system development process between the US and the UK which create barriers to effective bilateral cooperative development programs for tactical A/S weapons systems.

V. Recommendations: Because institutional differences exist, cooperative development programs require active participation by senior government officials in both countries. Therefore, cooperative programs should not be allowed to proliferate. US participation should be restricted to one or two projects for each service. A solid, agreed upon operational requirement must be the first criteria against which participation in any cooperative program is judged. Cooperative development programs are not an appropriate arena to resolve differences in technology transfer policy. A formal agreement as to the technology each country will make available to the program should be reached before development begins. Initially, cooperative programs should not push state-of-the-art technology limits. They should develop simple, inexpensive systems which are not critically important to the national defense of either country. Cooperative programs should follow an acquisition strategy which emphasizes early prototyping to prove system effectiveness. Finally and most importantly, initial cooperation efforts must be successful and timely.

Chapter One

INTRODUCTION

Improved conventional defense of NATO has been a frequent topic of discussion on both sides of the Atlantic. Limited defense budgets, a shrinking manpower pool, and the political environment have lead to this discussion. The Intermediate-Range Nuclear Forces (INF) Treaty under consideration by the US Senate makes conventional defense even more important. If this treaty is ratified, NATO must rely more heavily on its conventional forces to deter Soviet aggression. US Senator Sam Nunn states that NATO must use a three-track program to maintain peace in Europe: conventional force improvement, conventional arms control, and public education.(33:4) Focusing on the improvement aspect of this program, there have been many proposals on how to best achieve conventional improvements with limited defense budgets. One of the most promising methods is international cooperation.

International cooperation is when two or more nations agree to share information, money, or equipment to increase their defense capabilities. There are many different types of cooperation: ranging from the sale of defense equipment, through the sharing of information, to the cooperative development of an entirely new weapons system. The greatest potential benefits of international cooperation can be found in the cooperative development project. As used herein, cooperative development is when two or more nations join together to develop and produce a new weapons system by sharing inputs in some agreed upon fashion. Economically, potential savings for each country can be realized by ". . . spreading development costs, reducing unit production costs through longer production runs, and broadening the base for logistics support . . . {and} avoid{ing} duplication of effort . . . ."(34:13-1) Cooperative development helps militarily by increasing standardization and interoperability between the two countries. Politically, cooperative development demonstrates the two countries are willing to work together to achieve their mutual goals.(34:13-1)

The potential benefits of international cooperative development are obvious to defense planners on both sides of the Atlantic. The mid-1985 Nunn Amendment sought to promote US involvement in cooperative development programs.(23:20) As a

result of this "seed" money, significant effort has been expended to begin cooperative development programs involving the US and its NATO allies.

Despite the best efforts of professionals on both sides of the ocean, getting these cooperative programs underway has been a slow process. This paper will seek to explain why it is so difficult to cooperate, and offer suggestions to make cooperation work for NATO. One look at the conventional balance between the Warsaw Pact and NATO provides ample incentive for this analysis.

In order to limit the scope of this analysis, only two members of NATO will be examined--the United States and the United Kingdom. The main reason these two countries were selected was because ample reference material was available and translation would not be required. Also, rather than compare development procedures across the spectrum of defense equipment, the analysis was limited to a specific weapons type--tactical air-to-surface (A/S) weapons.

Based upon the purpose and these limitations, the following hypothesis served to focus the analysis: *there are systemic* differences between the US and the UK which create barriers to effective cooperative development programs for tactical A/S weapons. Four major areas will be discussed: (1) operational requirements, (2) technology transfer, (3) the acquisition process, and (4) program funding. In each of these areas the two countries will be compared and differences significant to cooperative development programs will be identified. Following that discussion, specific recommendations on how to facilitate cooperation between the two countries will be made.

Chapter Two

OPERATIONAL REQUIREMENT HARMONIZATION

PURPOSE AND OVERVIEW

Operational requirements are the foundation for any weapons system acquisition program. As an introductory definition, operational requirements are the operational commander's statement of needed capabilities described in terms of mission requirements; operational objectives; and employment, support, and maintenance concepts.(27:2) They can be thought of as the medium for the user to tell the developer what must be developed. Requirements are important whether the program is done on an international or a national basis. For international programs, the harmonization of requirements between the cooperating nations can be difficult. Agreed requirements are mandatory because, ". . . collaboration for the sake of collaboration simply doesn't work. The political will to cooperate is essential, of course, but if it is the only raison d'etre for a given cooperative program, that program is doomed to failure."(32:5)

The purpose of this chapter is to illustrate the difficulties of harmonizing US A/S weapons requirements with UK requirements for similar weapons. To the political leaders of the two countries, "It makes no sense to have different national R&D establishments all designing the same sorts of equipment to fight the same war on the same day and in the same place."(32:7) However, as with most things, the actual harmonization process is a complex, long-term effort involving meaningful performance trade-offs,(27:2) and there may be circumstances where it does indeed make sense to design different systems to meet different requirements for similar missions. The intent is not to denigrate international cooperation or to promote superficial harmonization efforts, but only to show there are good reasons why the defense establishments of the two countries may find it hard to reach harmony on some requirements.

This chapter will work toward the stated purpose by providing a more detailed definition of operational requirements; describing requirements evolution; and giving examples of systemic differences between the USAF and RAF which might call for different requirements, thereby, threatening the ultimate success of cooperative development programs.

OPERATIONAL REQUIREMENTS DEFINED

The operational commander (who) develops the requirement to tell the developer the what, when, where, why, and how of the desired weapon system. An understanding of the requirement process can be built by looking at each of the user inputs separately. As indicated in the introduction, this discussion will be limited to tactical A/S conventional weapons, although, requirements may be written for many other systems. The aircraft designated for carriage and the desired weapon mission are the "what" of the requirement. In the USAF and RAF, the operational commander (also referred to as the user) would likely require that a tactical A/S weapon be designed to allow carriage on all tactical aircraft. This would mean the weapon must be designed for compatibility with the F-15, F-16, F-111, F-4, A-10, and A-7 for the US. (26:26-30) In the RAF, the same weapon must be compatible with the Tornado, Buccaneer, Harrier, and the Jaguar. (26:59-60) Aircraft capabilities would be input to the design process as weapons specifications in the form of weight limitations, interface requirements, and launch envelopes. The weapon's mission might include one or more of the following: close air support, interdiction, or counter air. Included within the mission description would be the type of target, its location, and the desired level and probability of kill. The user must also tell the designer "when" the weapon is to be used. For example, plans for selective use in the first days of a war would entail different weapon characteristics than those required for a weapon to be used over an extended timeframe. For example, the selective use weapon would be required to operate in the highly dense threat environment that will exist in the first stages of theater warfare. As time passed, the threat would draw-down and a less expensive, less capable weapon could be used. The developer must know "where" the weapon will be employed. Is it to be used worldwide or only in selected regions? Storage and employment in Alaska is quite different than like activity in Hawaii. "Where" specifications must also tell the designer if the weapon is to be employed from low or high altitude. The threat the weapon must operate in and against to accomplish the desired mission establishes the "why" of the system requirement. Finally, the user must tell the developer "how" the weapon will be maintained and by whom. By addressing these five issues, the operational commander develops the requirements document to tell the developer everything he needs to know about the desired weapon.

The developer uses know-how and technology to meet the user requirements as best he can within the constraints placed upon him. Cost, schedule, and technology availability will be discussed, but they are just three examples of the types of constraints faced by those building new weapons. Programs face constant budgetary pressure in today's environment, indeed, much

of the impetus for cooperation comes from this pressure. "Neither we (UK) nor our allies can afford to dissipate scarce resources by unnecessarily duplicating development of the same equipment."(25:40) Budgetary pressure can develop because of research budget reductions or the imposition of an unit-cost ceiling. Schedule constraints are important for two reasons: (1) the threat is already or very nearly present, or the program probably will not be funded and (2) time is money. So, the program manager has two goals which may be at cross purposes with each other: the need to get something "on-the-street" and the desire to build the best possible system. Technology availability can also be a constraint, especially for cooperative programs. Transfer policy, the subject of the next chapter, may restrict technologies available to the program, and thereby limit the program manager's ability to meet some requirements. The developer is faced with demanding user requirements and has only limited resources available for the task. Moreover, the threat and knowledge of the threat continue to evolve causing the user to increase requirements in the midst of the development process. Thus, the developer can never quite "finish" the job and the user must face tough decisions with regard to getting less than desired, paying more, and/or waiting longer.

As a result of the interplay between stated needs and constraints, operational requirements are never absolute. The requirements process is iterative in that the user/developer team must make tradeoffs between capability, costs, schedule, reliability and maintainability.(27:2) The iterative nature of requirements development can best be illustrated by showing requirements evolution in the US and the UK.

REQUIREMENTS EVOLUTION

Requirements evolution is closely associated with the acquisition process in both the US and the UK. Each country uses the requirements document as a guide for the current phase of the program, and updates the requirement at the completion of each phase in preparation for the next step in program development. Figure 1, on the next page, shows the acquisition process for each country. The next chapter will compare the two processes in some detail; however for now, discussion will center on the requirements documents. The UK process will be discussed first. During concept formulation, the Defence Staff decides whether a new idea represents a valid military requirement. Ideas for new projects derive from such factors as: the need to replace old equipment, a change in doctrine or policy, a new actual or potential threat, technology advances, deficiencies in existing inventory, other nations' requirements, and industrial proposals. If a requirement does exist, the Defence Staff initiates preparation of the Staff Target (ST). The approved ST is used as input for the feasibility phase. The Defence Staff uses the results of the

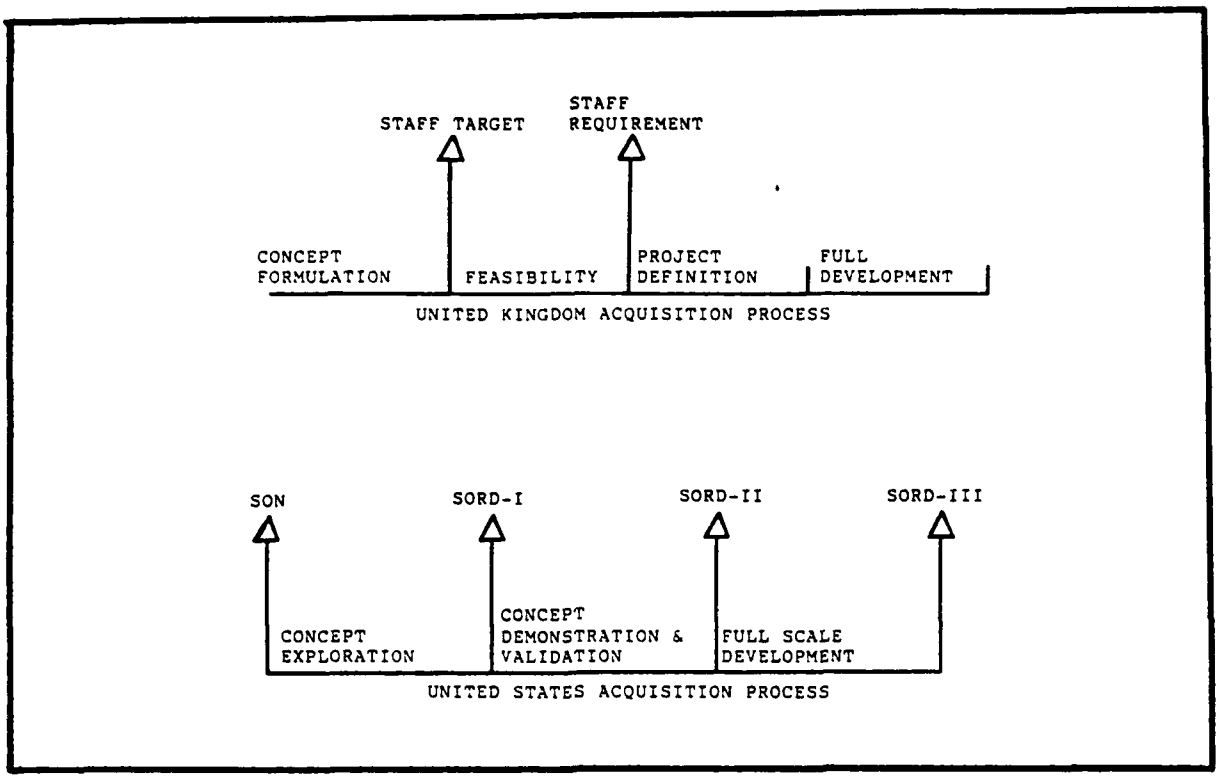

FIGURE 1. EVOLUTION OF UK AND US REQUIREMENTS DOCUMENTS

feasibility phase to update the ST; this next generation requirements document is called the Staff Requirement (SR). Again, the SR is used by the developer in the next phase, project definition. The SR continues to evolve through project definition and full development. Ultimately, the weapons system must show the capability to meet the SR before it is accepted. (34:2-2 - 2-7) Evolution of the US requirements document is very similar to that found in the UK. Mission area analysis is used to determine whether a requirement actually exists. This requirement is formulated in the Statement of Operational Need (SON) which is used as a source document for the concept exploration phase. During concept exploration, the first System Operational Requirements Document (SORD-I) is developed for use in the next phase. SORD-II is developed during the demonstration and validation phase. After full-scale development is completed, SORD-III is completed and approved. (27:21)

To this point, requirement evolution in both countries has been shown to be iterative in nature following the appropriate acquisition process. The requirement is continually refined as trade-off decisions are made and better information becomes available in each phase.

THE REASONS BEHIND REQUIREMENT MISMATCH

Systemic differences between the US and the UK will make harmonization of requirements difficult, and this difficulty will be most pronounced when trade-off decisions have to be made. This point can best be illustrated by giving examples of the difficulties cooperative programs face with respect to harmonization. Assume for a moment that the US and the UK both have a requirement for an A/S weapon system that can achieve multiple kills per pass against armor type targets. It would seem that the US and UK should be able to quickly agree on a cooperative development program. However, there are many reasons why it may be difficult to harmonize requirements. These reasons might include, but are not limited to: doctrine, force structure, mission, deployment plans, target, and threat. Two examples from this list, force structure and mission, will be discussed to show why harmonization can be difficult.

One problematic difference between the US and the UK is the mismatch in force structure between the two Air Forces. It must be recognized from the outset that these forces represent sunk costs to each nation and the forces are an asset which will take time and significant investment to replace. The RAF has approximately 25 tactical fighter squadrons. There are 11 strike squadrons, nine equipped with the Tornado GR-1 and two equipped with the BAe Buccaneer S-2A/B. There are five ground attack squadrons, three equipped with the BAe Harrier GR-3/T-4 and two equipped with the Jaguar. Finally, the RAF has nine air defense squadrons, two equipped with the Lightning F-6/F-3/T-5 and seven with the McDonnell Douglas Phantom (these to be replaced with the Tornado F-2). Altogether, the RAF has 555 total aircraft: Tornado(204), Buccaneer(52), Jaguar(75), Harrier(52), Phantom (150), and Lightning(22).(26:59-60) In contrast, the US has 109 active fighter squadrons, 46 Air National Guard squadrons, and 11 reserve squadrons. By aircraft type, the USAF has 4218 fighter aircraft: F-4(1212), F-15(757), F-16(977), F-111(336), A-7(371), and A-10(565).(26:26-30) Comparing the two forces, it can be seen that the Tornado and the Harrier will comprise 73% of the total force in the near future. In fact, the Tornado will make up 64% of the total UK force structure. On the other hand, the USAF F-16 comprises about 23% of the total force although the percentage within active fighter forces will be slightly higher. The implications of this size differential can be significant. For example, if one of the trade-offs requires a decision between a more expensive weapon or aircraft modifications, the UK might prefer the latter because they have fewer aircraft to modify. If the most effective design could only be used on one aircraft in each country's inventory, the UK might be willing to accept this option because the Tornado makes up such a large part of their inventory. The US, on the other

hand, might be less willing to accept this option because any one aircraft makes up a smaller percentage of the total inventory.

Besides the issue of force structure size, the individual aircraft within each force must be considered when designing weapons. For example, the Tornado and F-16 have different characteristics which must be considered by the developer. With regard to flight performance, the F-16 is able to pull nine G's if the weapon weight is kept below 2000 pounds and the store is carried on the center wing-station. (11:410-413) The Tornado is capable of pulling 7.5 G's. (11:123-125) Therefore, the US might prefer a smaller, higher G capable weapon while the UK might opt for a heavier weapon designed for less stress.

The missions of the two Air Forces are different which result in different requirements.

> The United States has global interests and commitments. The security interests of the United States, its allies, and friends continue to be challenged by the sustained growth and complexity of Soviet military power, Eastern bloc and surrogate exploitation of regional conflicts, and instabilities in many areas of the world . . . . Therefore, US forces must be capable of meeting regional challenges as well as threats of global dimension. Readiness, sustainability, and sound force dispositions are imperatives of the US military posture. (31:1)

On the other hand, the RAF primary responsibility lies principally with NATO.

> The government's policy, therefore, is to concentrate its defense effort on the alliance and to deploy the armed forces of the United Kingdom in the areas in which they can make the most significant contribution to the security of the alliance and, through that, to national security. It judges these areas to be the Eastern Atlantic and Channel, the Central Region on the mainland of Europe, the security of the United Kingdom base and the strategic nuclear deterrent. During recent years, commitments outside the alliance have been reduced, and the concentration of defense resources on NATO has been continued. (6:1)

Different missions can mean different requirements.

Different missions mean the expected threat might be different. In the regions specified by the UK, the only plausible threat is from the Soviet Union. The US must also be concerned with the Soviet threat, but there are regions where the threat is quite different. The Pacific region is one area where a different threat array may be found. Threat can drive weapons requirements such as employment envelopes and countermeasures.

Besides different threats, mission requirements can call for other weapon's characteristics. Deployment and storage of weapons is yet another example where differences in mission call for different requirements. The worldwide commitments of the USAF require weapons to be designed for more extreme climatic conditions than those found in NATO. For example, the extreme high and low for Berlin, GE over the past 30 years are 96° F and -15° F respectively. While those in Cairo, Egypt are 117° F and 34° F; and in Fairbanks, Alaska they are 99° F and -66° F. (9: 752-753) From an engineering standpoint, these differences could represent a significant cost to both cooperating parties, an additional cost the UK might not like to share. Again, these problems taken individually are not insurmountable. The US might build a NATO-only weapon and then build storage shelters in other regions or bear the cost differential itself.

Harmonization of requirements is not an impossible task. The United Kingdom reached agreement with other nations on 13 Staff Targets in 1984-1986. (25:46) These agreements represent a great deal of hard work by the military staffs of each participating country, and it is popular to cite these agreements as proof of progress in the cooperative development business. However, this optimism must be viewed from the proper perspective. The NATO Staff Target is the first formal requirements document and many of the crucial trade-off decisions remain to be made. Difficult trade-off decisions must be agreed as the cooperative program proceeds through the acquisition process and the requirements document evolves. Differences in force structure, mission, and other areas not discussed can make these trade-off decisions that much more difficult for a cooperative program.

SUMMARY

Operational requirements are crucial to every development program because they define the capability which the new weapons system is designed to meet. Also, the requirements process is the interface mechanism between the user and the developer. Based upon the requirement, the developer attempts to optimize the design, but constraints make this impossible. Successive iteration of the requirements document reflect interaction between the user and the developer which result in key trade-off

decisions. Systemic differences between the US and UK make harmonization of requirements difficult. These difficulties are keys to the success of cooperative programs because ". . . collaboration for the sake of collaboration" does not work (32:5). A cooperative program requires an agreed requirement with which all participants can live.

Chapter Three

TECHNOLOGY TRANSFER ISSUES

PURPOSE AND OVERVIEW

Different US and UK viewpoints with regard to technology transfer are an obstacle to successful cooperative development efforts for two reasons. First, different viewpoints may limit the technology made available to the cooperative program. Secondly, different viewpoints will likely lead to disagreement between the cooperating parties concerning technology availability, third party sales, and disclosure policy. The sharing of technology and technological know-how is of critical importance to any cooperative development effort because of the stringent operational requirements imposed on modern weapons development programs. This chapter will define technology transfer, explain why technology transfer is a problem, and compare US and UK viewpoints to identify differences between the two countries.

TECHNOLOGY TRANSFER DEFINED

To define technology transfer, it is first necessary to define the word technology.

> Technology is the application of science to the manufacture of products and services. It is the specific know-how required to define a product that fulfills a need, to design the product, and to manufacture it. The product is the end result of this technology, but it is not technology. (14:8)

From this definition of technology, a working definition of technology transfer was developed to provide a common point of reference to begin this chapter. Technology transfer, then, is the disclosure of know-how to others to such a degree that they comprehend and are able to use the technology independently of the originator.

Technology transfer can be facilitated in many ways, and the methods used in the transfer process are appropriately called transfer mechanisms. Active transfer mechanisms, people-to-people exchange, are generally thought to be most effective.

(18:41) Examples of this type of transfer include: academic exchanges and joint projects, detailed contract negotiations, guided plant visits, training for purchased products, and conferences.(7:123) Examples of less effective passive mechanisms include: trade exhibits, commercial literature, undocumented sales proposals, and licenses without know-how.(14:12-13)

Technology transfer is a complex process which requires human interaction for truly effective communication. Because technology transfer involves the transfer of know-how, it is more than the transfer of hardware. The recipient of technology transfer must understand how the system works and why it was built in a particular manner. Active transfer mechanisms allow the human interaction needed for efficient transfer. Transfer controls can lead to lengthy acquisition chains, less knowledgeable links, and poor quality control by intermediaries making it extremely difficult for the recipient to achieve complete technology transfer.(7:127-128)

Two concepts are very important to one's views on controlling technology transfer--assimilation and integration. Assimilation is the ability to apply new technology throughout society. Some say the Soviets have a very poor record of successful assimilation. For example, the Soviets paid for technology to build an automobile plant. When it came time to build another facility, they paid the West for the technology again rather than transferring it internally.(10:98-101) Others agree that assimilation in the Soviet civilian sector is poor, but believe the military sector has been able to assimilate Western technology. Integration is the process of putting it all together to make a system that uses each bit of technology. Some see the biggest Soviet problem in technology transfer as an integration problem, that is ". . . their inability to put it all together rather than any simple technology weakness."(5:155) The challenge seems to be twofold, acquiring the technology and using it. Some see learning to use the technology as the real challenge.(21:7)

TECHNOLOGY TRANSFER CONTROLS

Those seeking to control technology transfer have two different areas of concern. Most familiar is the national security concern; the technical problem of identifying militarily critical technologies and controlling them so as to protect the military advantage we obtain through their use. This is referred to as East-West (E-W) transfer because the West (NATO and Japan) seeks to protect the transfer of Western technology to the Soviet Union and her allies. The second area of concern is technology transfer within the industrial West, and between the West and third world countries. This aspect of technology transfer is known as West-West (W-W) transfer.

E-W Technology Transfer

The primary objective of E-W technology transfer policy is to deny communist countries access to military technologies which could be used against the West. Obviously, this objective is primarily directed at the USSR. E-W transfer is particularly important to the West because superior technology is thought to offset the numerical advantages often enjoyed by the Soviets and their allies. (14:11)

Besides the national security aspects of E-W transfer just discussed, there is also an economic consideration. Stated simply, technology transfer that increases the Soviet Gross Domestic Product will increase the money available for military investment. So, any type of technology transfer can ultimately lead to increased Soviet military power.

Overall, there seem to be five major themes in E-W technology transfer: (1) there is no simple answer to the effects of technology transfer on Soviet capabilities; (2) Soviet assimilation and diffusion of Western technology is generally poor; (3) the Soviets desire to remain independent of the world economy; (4) specific sectors of the Soviet economy are more adept at using Western technology; and (5) due to the growth of interdependence and diffusion of economic power, it is difficult to apply economic leverage or denial without the help of ones allies. (17:vii-ix)

W-W Technology Transfer

Not only does the West wish to maintain its advantage over the East by controlling E-W transfer, but each Western nation wants to recoup government investments in technology development and allow industry to profit from their own innovation. W-W transfer policy must support E-W transfer policy, protect investment, and maintain international competitiveness.

One reason to control W-W technology transfer is to protect national technologies from unauthorized disclosure by another Western nation. The alleged transfer of technology by Kongsberg Vapenfabrik and Toshiba, which will enable the Soviets to make their submarines quieter, is an example of the type of unauthorized E-W transfer which leads to W-W controls. (22:674) In the future, the US may deny W-W transfer, not to protect it from Western allies, but for fear the allies may not protect it sufficiently.

Notwithstanding its support for national security objectives, W-W technology transfer can also be viewed as a trade issue. Technology transfer is just another form of trade, the trade of ideas as opposed to goods or services. (16:330-331) It

seems the main distinction rests on the assumption that technology transfer is more valuable because it lasts longer or is diffused.(5:163-166) Thus, W-W transfer policy is important to industry because they desire to exploit the competitive advantage offered by the technology they own. Government controls can deny industry the opportunity to press what could be a transitory advantage.

The Utility of Technology Transfer Controls

Historically, advanced countries have found it to be extremely difficult to completely stop technology transfer. If the West cannot completely stop technology transfer, two views on transfer can be developed based upon one's opinion on assimilation and integration. One view holds that since they will get it anyway, the only way to stay ahead in the race is to run faster.(16:338) This group believes the Soviets can not assimilate or integrate Western technology well, and they see little significance in the contribution of Western technology to Soviet military potential.(5:164) This group also believes technology transfer controls slow development in the West and do more harm than good. On the other hand, some believe the Soviets are able to assimilate Western technology for military purposes because of the high priority placed on military developments.(19:355) This second group believes transfer controls force the USSR to use less effective transfer mechanisms which deny real technology transfer.(7:126) The Soviets may be able to steal the end-product, but they will not really attain true technology transfer.

TECHNOLOGY TRANSFER POLICY AND COOPERATIVE DEVELOPMENT

Technology transfer policy is important to cooperative development programs for two reasons. Of primary importance, is technology availability. From a military standpoint, operational commanders would like the most capable systems possible. Thus, if a country is holding back its best technology because of E-W or W-W trade concerns and similar technology is not available in the other country, the cooperative program will not build a weapon with as much capability as is possible. For example, if computer technology such as a new processor is not available to the program because of transfer concerns, an older processor of less capacity and speed would have to be used. The new weapon may not be able to meet the future threat because of the limited on-board computation capability. Another problem with holding back technology is the perception of commitment to the program. Will a country be truly committed to a program that uses technology which it knows to be inferior? Or, will the possessor of the better technology begin a national program or plan to modify the cooperative system unilaterally to improve its capability? In either case, will the cooperative program

survive? There are no easy answers to these questions, but clearly, these issues can have a powerful influence on the outcome of a cooperative program.

This questioning process leads to and is part of the second reason technology transfer policy is important to cooperative programs. Different technology transfer polices can lead to friction between the cooperating parties. As used here, friction is present when the management of technology transfer receives higher priority than management of the development effort. If technology is withheld, friction could be caused when one country is pressured to make technology available, or one of the participants decides to withdraw from the program because it has the technology to do the job better unilaterally. Assuming a country makes technology available to the program with the understanding it will be used only for program purposes, two other types of friction are possible. If the two cooperating countries have different views on making that technology available to third parties, one might favor a sale to a country while the other does not. This could be a significant political problem. Secondly, if this technology made its way to the East or was used in other development programs, the resultant "finger pointing" would certainly cause friction. Technology transfer issues can prevent successful cooperative development programs, and these issues will occur more frequently when the cooperating parties do not share similar technology transfer policies.

TECHNOLOGY TRANSFER FROM AN US PERSPECTIVE

It is difficult to precisely define US technology transfer policy because of the ambiguity and uncertainty which typify that policy.(2:119) However, it is possible to develop a generalized US view on technology transfer by looking at current legislation, Executive Branch implementation, and US industry perspectives.

The Export Administration Act of 1979, as amended, continues Presidential authority, subject to Congressional oversight, to control US technology transfer. He may invoke export controls to protect national security, promote US foreign policy, and to guard against short supply.(3:128-137) While the US and its allies agree national security must be protected, although there are disagreements on what constitutes a security risk, US use of export control for foreign policy purposes is unique within NATO.(1:271) A good example of export control for foreign policy objectives was the unsuccessful oil pipeline embargo which the US tried to impose on the USSR because of the Afghanistan invasion. The technology was denied to show US displeasure with the invasion, not to protect technology of military significance. It is also illustrative to note that because US allies did not share the same foreign policy objectives, the

Europeans and Japanese won significant gains in exports to the USSR as the Soviets consciously avoided US products. (5:163-166)

In the late 70's, the US and its allies attempted to follow a policy of economic diplomacy. Basically, this policy was to use trade, including technology transfer, to affect Soviet foreign and domestic policy.(1:252) "The (US) allies tend to view trade as a 'carrot,' an instrument of positive linkage, rather than a 'stick.'"(4:174) The Europeans, led by the Germans, place a higher priority on maintaining economic ties with the East. They believe trade can moderate Eastern foreign policy; but they reject the use of sanctions and embargoes as being ineffective.(20:295,319) In short, US allies believe in economic diplomacy.

President Reagan brought significant E-W technology transfer concerns to office along with his plans to rebuild US military might. First, he rejected the theory of economic diplomacy because there was no evidence of modified Soviet behavior and the technology was used by the Soviets to continue their military build-up.(15:258) As a result, he instituted a new package of measures to curtail E-W transfer including: strengthening technology transfer controls, increasing efforts to control espionage, expanding the list of militarily critical technologies, and increasing controls on Soviet access to academic circles.(1:266) Administration officials were under no illusions as to how difficult it would be to convince its allies these new transfer policy changes were needed as the Europeans still favored economic diplomacy.(1:267)

Defense industries are big business, both in the US and in Europe;(21:49) and from a US industry perspective, controls and restraints help make markets for their competitors.(16:325) US government transfer controls restrict US industry from exploiting the comparative advantage of the technology they own.(16:336-337) Again, because of the US attempted pipeline embargo, the Soviets now choose their trade partners based on technology, price, reputation, ability to meet schedules, and government trade policies.(10:105) As a result, US companies have a difficult time competing for Soviet markets. Industry does risk the formation of a competitor by exposing technology within a cooperative development program. However, US industry seems to feel the risk is worthwhile for two reasons: cooperative programs offer the prospect of large markets and because of an attitude, ". . . by the time he (the European company) is really in position to compete, I'll (the US company) have moved on to bigger and better things."(32:9)

COMPARISON OF US AND UK TECHNOLOGY TRANSFER VIEWS

As inferred in the previous section, UK views on technology transfer are somewhat different than those held in the US. First, the UK agrees militarily critical technologies should be denied to the East. However, the UK has a much more relaxed view as to what should or should not be controlled.(13:144) This is especially true of dual-use technologies. Dual-use technologies are those civilian technologies which have an inherent military capability. For example, computers can be used to track inventory, make ballistics calculations, or design military hardware.

In general, the UK shares the views of the other European nations with regard to the use of technology transfer controls for foreign policy purposes. The Western Europeans favor the depoliticization of trade because it is felt more trade will lead to better relations with the East. They also feel trade sanctions are not an effective means to show disapproval for Soviet actions.(13:143)

US/UK TECHNOLOGY TRANSFER INTERFACE

The Coordinating Committee for Multi-lateral Export Control (COCOM) is the international forum where US and UK E-W technology transfer policies meet. After WW II, the US organized COCOM to control Soviet access to important Western exports. Members include Japan and all NATO nations except Iceland. Participation in the COCOM organization and compliance with the COCOM commodity control list is strictly voluntary.(3:127) Although the difference varies from year-to-year, the US Commodity Control List (CCL) always contains more items than the corresponding COCOM list. For example in 1978, the US CCL had 207 entries while the COCOM list had 123.(13:146) In effect, this meant the US could not share 84 items with its allies because there was no agreement they would be protected. As compared to other COCOM members, the US has a longer list of militarily critical technologies, more comprehensive laws on technology transfer, and a more restrictive view on trade with the East.(20:286)

In fairness to the Europeans and Japanese, COCOM works because the allies are committed to preventing military technology from reaching the Soviets.(20:313) Differences arise in the identification of the equipment or technologies with military-specific uses, and occur mainly in the dual-use technology area. Some dual-use items, such as various computers, are on the CCL but not on the COCOM list.

Reagan administration efforts to block Soviet access to US technology may have a major impact on NATO if it moves to

tighten W-W technology transfer to control leakage from Europe and Japan to the East.(20:318, 21:10) To strengthen COCOM and facilitate intra-alliance transfer, the US has tried to have new rules implemented to keep its allies from shipping high technology products to non-COCOM members by asking them to identify their customers.(20:315) Also, the US retains the right to apply US export controls to US subsidiaries, licensees, and other affiliates, even in other nations.(1:273) Thus, if US radar is used in a UK plane, the US could block the sale of the aircraft to a non-COCOM country. The new rules and US policies on reexport are viewed as an infringement on sovereign rights by the other COCOM members including the UK.(12:162)

SUMMARY

In this chapter, technology transfer and differences between US and UK views on transfer controls were the topic of discussion. Technology transfer is the transfer of know-how to another country. Those seeking to control the transfer of technology must be concerned with two different types of transfer: E-W transfer or transfer to the Soviets and their allies; and W-W transfer or exchange between the US, NATO, Japan, and the third world. Transfer policy is important to successful cooperative development because it might affect technology availability, and different policies could lead to friction between the cooperating parties. The US views technology transfer primarily as an E-W problem, and is quite different from other NATO members because of its use of transfer controls as an element of overall foreign policy. The UK controls transfer for national security reasons, and is less restrictive on dual-use technology transfer. The US may not share technology which is not protected by COCOM agreements; conversely, the UK may not wish to join in a program using US technology subject to US foreign policy controls. The possibility of US restriction on W-W transfer to prevent E-W leakage can have a significant effect on cooperative programs. The challenge for cooperative development programs is clear. As long as there are divergent viewpoints between the two countries, technology availability must be a concern. Once technology has been made available, the two countries must coordinate on third party sales (i.e. seek to meet or disregard US foreign policy goals), keep cooperative programs going so US industry will commit, agree on a mechanism to reassure UK industry they are not building competitors in the US, and agree upon some mechanism to settle problems such as unauthorized use or disclosure of technology made available to the cooperative program. These challenges are not insignificant.

Chapter Four

COMPARISON OF UK AND US ACQUISITION PROCESSES

PURPOSE AND OVERVIEW

Operational requirements and technology are input to the acquisition process with the hoped for output being an effective weapons system. The cooperative development program must bridge the gap between input and output, and at the same time be able to interface with the two governments and industry through existing mechanisms. The US and UK have developed similar yet different processes. The purpose of this chapter is to identify industry and government problems arising from differences between the acquisition processes of the two countries. To reach this goal, the acquisition process of each country, through full scale development, will be described and compared.

UK ACQUISITION PROCESS

The UK acquisition process is divided into seven project phases: concept formulation, feasibility, project definition, full development, production, in-service, and disposal.(34:2-1) An understanding of the first four development phases will be built by describing the information required to initiate the phase, the work accomplished within the phase, and the phase output. For purposes of comparison, the procedures described will be those associated with a major weapons system which is defined in the UK as a system with an estimated total research and development cost greater than $32.5 million or production greater than $65 million (1.30 dollars = 1 pound).(30:4)

The concept formulation phase can be thought of as the process of obtaining agreement that a requirement does exist. To begin this phase, an original idea is taken to the Defence Staff. The Defence Staff, the operational command, the developer, and industry then consult to explore the merits of the new concept. Based upon these consultations, the Defence Staff makes the decision as to whether to initiate the development of a formal requirement. The output of this phase is the draft Staff Target (ST), the first requirements document.

Based upon the ST, the Systems Controllerate (land, air, or sea arms of a defense-wide systems command) begins the feasibility phase. The feasibility phase will make paper assessments,

evaluate, and conduct engineering work as required to validate the basic concept and identify technical problems. The goals are to establish feasibility, provide accurate costs for the next phase, and estimate the cost, duration, risk, and resource requirements for the entire program. The Defence Staff then develops a Staff Requirement (SR) based on the results of this phase.

Project definition is the subsequent phase of the UK acquisition process. The newly developed SR serves as the basis for the definition phase. Work is normally carried out by one or more contractors although some work may be accomplished in government research establishments. The work will ultimately include design and preliminary engineering work, construction of models, prototype sub-systems, component testing, and possibly, flight testing of representative system hardware/software. The goal of this phase is to select the preferred technical solution and to develop detailed technical specifications for the weapons system. The contractors must submit detailed proposals for full development, estimate total program cost and duration, and recommend a procurement strategy. The Defence Staff will then revise the SR. The Equipment Policy Committee (EPC), consisting of members from all government departments, reviews the requirement, and the Ministers give final approval before full development can begin.

Full development builds upon reports developed by the contractors *during project definition*. In this phase, the final design of the system is completed. Engineering tasks may include the "manufacture of models, prototypes, and, in some case, preproduction versions."(30:47) The design is then input to the production phase.
(Sources for the phase descriptions in the preceding section were 30:45-49 and 34:Chap 2)

US ACQUISITION PROCESS

The US acquisition process has five phases which encompass a framework similar to that described for the UK. The five phases of the US process are concept exploration/definition, concept demonstration/validation, full-scale development, full-rate production/deployment, and operation support.(28:3-4) As before, discussion will be centered on the first three of these five phases. Many US acquisition directives are in revision to incorporate recommendations made by the Packard Committee.(24:39-71) In an effort to make this comparison as accurate as possible, the latest available versions of these directives were used even if they were not in final form. In the US, a major weapons system is defined as a system with an estimated total research and development cost greater than $200 million or production cost greater than $1 billion.(30:4)

A Milestone 0 decision is required before initiation of the concept exploration/definition phase. The Secretary of Defense has the final authority on major program milestone decisions, but recommendations from the Defense Acquisition Board (DAB) are influential.(28:1-10) A Milestone 0 decision is an affirmation that a requirement exists. The first requirements document, the Statement of Operation Need (SON) is completed concurrently with the Milestone 0 decision. Considerations in making the Milestone 0 decision include: "mission area analysis, affordability and life cycle cost, alternative solutions, and operational utility assessment."(29:2) As the name implies, the goal of this phase is to validate the requirement and the system concept for meeting that requirement.

The concept demonstration/validation decision is initiated with a Milestone I decision which establishes broad goals on cost, schedule, effectiveness, and suitability. The goal of the program manager in this phase is to develop a solution within these Milestone I goals while meeting the requirements specified in the SON. The DAB considers the results of tradeoff analyses, appropriateness of the acquisition strategy, plans for prototyping of the system and/or system components, affordability and life-cycle costs, and potential joint/cooperative development opportunities when making recommendations on the Milestone I decision. "Competitive prototyping of critical components, subsystems, or systems and early operational test and evaluation beginning in the concept demonstration/validation phase are encouraged and shall be emphasized."(28:16)

The Milestone II decision gives Secretary of Defense approval to begin the full-scale development phase for major systems. This decision establishes more specific goals on cost, schedule, effectiveness, and suitability based on the SORD. The results of this phase are a complete engineering package and might include low-rate initial production prior to the full-rate production decision.
(Unless cited otherwise, the source for the phase descriptions in the preceding section was 29:--)

COMPARISON OF THE UK AND US PROCESSES

As the sub-title indicates, the purpose of this section is to compare the acquisition processes of the two countries. However, before getting into the comparison, a description of some environmental factors which greatly affect each process will be given to facilitate discussion.

Three factors are important in order to maintain perspective as the two processes are compared. In many cases, these factors are useful in understanding why the two systems are different, but more importantly, they explain why it is not easy for one or

the other country to adapt its process for the sake of cooperation. First, the relative size of the defense budget between the two countries is significantly different. The approximate defense budget for the US was $300 billion while the UK budget was about $23.5 billion in 1986 (1.30 dollars = 1 pound).(30:4) This difference is not only seen in research and development programs, but in the facilities and people available in the US to conduct development activity. Examples include test ranges, government laboratories, and non-government organizations. Secondly, because the US has more testing resources, the government tends to do a lot of independent testing to supplement contractor testing. The UK does some government testing, but relies on the contractor for most tests in the early stages of the acquisition process. Thirdly, the industrial base in the two countries is significantly different. The US has several prime contractors for almost every defense product while the UK usually has only one per product type.(30:5) Thus, the US acquisition process can emphasize competition while the UK process is usually restricted by the number of primes available. Also, defense industry in the UK is partially government owned (30:5) which tends to limit opportunities for competition at the prime level. These factors should be kept in mind as we move to comparison of the two countries.

The UK and US acquisition processes appear to be very similar;(30:3) however, there are differences between the two and these differences can spell difficulty for cooperative programs.

In comparing the two systems, one difference is readily apparent. The UK has four development stages (concept formulation, feasibility, project definition, and full development) while the US has only three (concept exploration/definition, concept demonstration/ validation, and full-scale development). Because of the different number of phases, the phase points do not match. This is important because the program generally interfaces with the management structure at these phase points as officials decide whether to commit to the next phase. At a minimum, a cooperative program must generate information at six points instead of three or four. Besides this mismatch in phase points, emphasis within each phase is different.

The US concept exploration/definition phase overlaps both the concept formulation and feasibility phase in the UK. As you will recall, the Milestone 0 decision leading to this phase in the US, is based upon mission area analysis, affordability and life cycle costs, alternative solutions, and operation utility assessment. These functions are performed in the USAF at the Air Staff (Mission Area Analysis and alternative solutions), Headquarters Air Force Systems Command (affordability and life cycle costs), and Headquarters Tactical Air Command (operation utility assessment). The contractor merely confirms or denies the results of USAF

analysis. As shown earlier, the UK does not have the resources to match this scope of effort. Therefore, much of this information is generated independently by contractors during the feasibility phase. The problem for cooperative programs can be easily seen. The US does not need a separate feasibility phase because of government work and the competitive pressure between numerous prime candidates. The UK, on the other hand, is in the position of either accepting the US government analysis at face value, getting the US to agree to fund a feasibility phase, or paying for a feasibility phase unilaterally. Also, if there is no feasibility phase, UK industry will be at a disadvantage because it may not get access to US government derived values prior to program initiation.

The situation in looking at the next phase is somewhat similar. The UK project definition phase is somewhat analogous to the US concept demonstration/validation phase. However, with the incorporation of the Packard Committee recommendations on early competitive prototyping, US concept demonstration/validation contains some of the tasks normally accomplished by the UK in full development. Thus, when the cooperative program reaches the decision point for entering project definition (concept demonstration/validation) it has another problem. If it contains the work desired by the US, the project definition phase will appear to be very expensive to UK authorities. If instead, it conforms to UK expectations, the program will appear to be in disregard of Packard Committee recommendations.

Finally, the full-scale development/full development phases can be seen to have the similar problems. Whatever decision is made on prototyping, full-scale development will be effected. The US includes low-rate initial production in the full-scale development phase which greatly increases the apparent cost of this phase. Will UK government officials accept the added expense or will the US allow full-scale development to be completed without low-rate production beginning? Figure 2, on the next page summarizes the discussion. While the two processes are similar, there are differences between the two.

SUMMARY

This chapter has shown some of the difficulties that cooperative development programs face because they must adapt to the acquisition processes of two different countries. The UK acquisition process is divided into seven different phases of which the first four are concerned with development. These phases were concept formulation, feasibility, project definition, and full development. The comparable phases of the US acquisition process are concept exploration/definition, concept demonstration/validation, and full-scale development. While each acquisition process ultimately results in a complete system, it

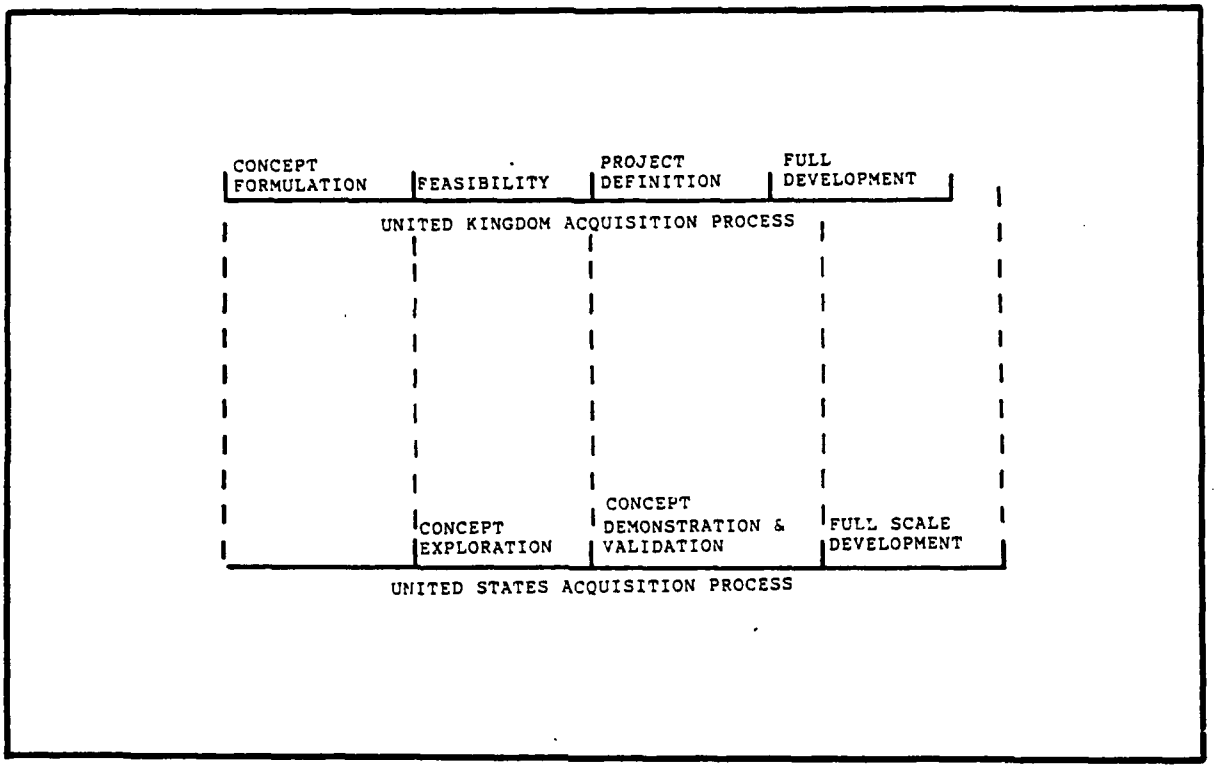

FIGURE 2. COMPARISON OF UK AND US ACQUISITION PROCESSES

was shown there are internal differences between the two. These differences are phase point mismatch and phase content. When viewed within the context of environmental factors, such as, the size of the defense budget, industrial base, and test philosophy, it is apparent that these differences can cause difficulties in creating and managing cooperative programs.

Chapter Five

PROGRAM FUNDING

PURPOSE AND OVERVIEW

Cooperative programs are unique in that they have to compete for funding in each of the participating countries. When making decisions as to whether to fund cooperative programs, officials must be knowledgeable of the costs and benefits of cooperative development. The purpose of this chapter will be to show it is more difficult for cooperative programs to compete for funding in the US than the UK. To reach this objective, the UK budget process will be described and then compared to the US. Following this comparison, the funding problems for cooperative development programs will be discussed.

THE UNITED KINGDOM BUDGET PROCESS

Funding for defense programs in the UK, is to a large degree, under the exclusive control of the executive branch of government. The parliamentary nature of the government means the ". . . executive can normally command an automatic majority in Parliament, which therefore has no veto on defence policy." (8:45) Parliamentary disagreement with executive defense proposals would be regarded as a loss of confidence, calling for national elections. As a result, executive programs are expected to emerge unchanged from the Parliamentary approval process.

Within the executive branch of government, defense policies are under the control of one individual, the Secretary of State for Defence. The cabinet, lead by the Prime Minister, has the final authority on all matters within the executive branch, and within the cabinet each member is given the authority and responsibility to manage his own organization.(8:40) "The Secretary of State for Defence is, then, subject to the continuing support of his cabinet colleagues, completely in charge of defence business, and able to speak in Parliament with the full authority of the government on all defence matters." (8:41)

Not only does the Secretary of State for Defence represent defense views within the cabinet and before Parliament, the Secretary's position of authority over the Services and the procurement of new weapons is virtually absolute so long as he has the support of the other cabinet members.(8:42) In the UK,

the executive has the authority to reallocate resources within the budget so long as it matches the total approved by Parliament.(8:78) From his position of authority on the cabinet, the Secretary of State for Defence may make resource allocation decisions between the land, sea, and air services. "However the situation is analyzed or examined, the focus of bureaucratic politics and inter-Service argument in the United Kingdom is seen to be the Secretary of State for Defence himself."(8:43)

Besides the vertical control of the budget process in the UK Ministry of Defence, budgetary planning within the government is quite stable. With publication of the Public Expenditure Survey (PES), the government essentially commits to a level of defense spending for a period of three years.(8:87-88) The implication of this commitment for cooperative development programs is obvious, ". . . once the budgets for new weapons systems are fixed, they tend to remain immune to cancellation or major reductions during subsequent reviews."(8:88) Once a program is approved to enter one of the acquisition phases in the UK, funding for completion of that phase is almost assured.

COMPARISON OF UK AND US BUDGET PROCESSES

Where the UK budget process is typified by its vertical control and its relative stability, the US funding process is exemplified by horizontal control and its relative instability.

Horizontal Versus Vertical Budget Control

The US, in contrast to the UK, does not have one person with the authority to make program funding decisions. This is largely due to the separation of powers specified in the US Constitution. While the President, as Commander in Chief of the armed forces, was given the responsibility for defense, Congress must appropriate the funds needed by the President to develop, maintain and use those forces. The President, through the Office of the Secretary of Defense, plans and budgets forces, but Congress must approve those plans. Unlike the UK, where the executive commands almost the automatic legislative endorsement of its budgetary proposals, in the US the President cannot mandate cooperation from Congress.(8:41) The US Congress approves individual line items which gives it more control over the budget than the House of Commons where only the overall level of defense spending is approved. Thus, funding in the US is determined by negotiation rather than executive direction, and this negotiation can extend to individual items within the budget.

Not only is negotiation between the executive and the legislative branch a characteristic of the US budget process, but the legislator in the US is much more able to act independently within Congress. In the UK, leadership in the House of Commons

can command a majority because of the strong party system which exists in that country.(8:53) In the US, Congressional leadership cannot make this same claim. The President must negotiate with Congress, but it is difficult for him to find those leaders who can rely on the support of a majority of their fellow legislators.

Another feature of the US system is the ability of actors outside the executive and legislative branch to influence the budget process. For example, industry representatives are able to lobby Congress to influence funding for individual programs in the budget.

In the UK, the Secretary of State for Defence enjoys a real position of authority on defense matters. The Secretary of Defense in the US acts mainly in an advisory capacity. In the US, the final authority on defense matters rests with one person, the President. In fact, there are other executive agencies which advise the President on defense matters, such as the National Security Council and the Office of Management and Budget.(8:43-44)

Within the executive branch, the Secretary of Defense is the primary advisor on defense matters, but there are other agencies which can influence the President on resource allocation decisions. The US horizontal budget process is in sharp contrast to the highly vertical UK budget process where one person has the authority to make decisions, and he is generally influenced from below.

The Relative Stability of the Funding Processes

Previously, the UK budget process was described as being relatively stable because of the Public Expenditure Survey (PES) which essentially commits the government to a level of defense spending for a period of three years. The planning and programming phases of the US Planning, Programming, and Budgeting System (PPBS) cover a five year period, but the budgeting phase covers only the next year. This is because the US Congress prefers to budget one year at a time, and has not shown any interest in making budget commitments for longer periods. Besides, the year-to-year fluctuations caused by this fact, Congress has been unable to pass a budget before the beginning of the fiscal year. As a result, the government has been required to operate on continuing resolutions. These two facts tend to make the US funding process far less stable than that found in the UK.

IMPLICATIONS FOR COOPERATIVE DEVELOPMENT PROGRAMS

With regard to the UK, the cooperative development program essentially has only one person to sell, the Secretary of State

for Defence. The US, on the other hand, will be a more difficult place for the cooperative program to survive because it must sell many different organizations with somewhat divergent interests. Besides the President and the Secretary of Defense, the services, industry, and Congress must be convinced a cooperative development program is serving the needs of the US as they view them.

From an individual military service perspective, there are many reasons a cooperative program might not receive enthusiastic support. First, a cooperative program may not be the best way to meet the basic requirements of the US operational commander. The US will have less control over trade-off decisions in cooperative development programs because the trade-offs must be negotiated with the other participant. Second, commitment to a cooperative program reduces the flexibility needed to adjust to budget changes. For example, assume there are three A/S tactical weapon development programs funded by the USAF this year. The number three priority program is a cooperative program with the UK. There were enough funds for all three programs at one time, but Congress cuts funds. Now, the USAF can only afford two. Normally, the USAF would cancel the number three priority program, but it cannot do so without UK agreement. However, the cooperative program is very high priority for the UK and they do not wish to see it cancelled, and the USAF may be forced to cancel a higher priority program because it has committed to a cooperative program. Third, cooperative programs increase international interoperability, but they may inhibit inter-service interoperability. For example, the UK does not have an extensive investment in naval aviation, and may not be willing to make the trade-offs required to develop a tactical weapon capable of carrier operations. The USAF and the RAF would be able to use the new weapon, but the Navy would not. Finally, the US may remain committed to a failing program for political reasons.

Cooperative development programs will have less industry support in Congress than a comparable national program. Nations share the costs of development with the understanding that the work resulting from that investment will be fairly distributed to industry within each country. Each nation wants to develop an effective weapons system, support its national economy, and maintain a sound industrial base. These three goals cannot be met if all the work is done in only one nation. Industry must form teams so they can share work and protect their own interests. Since the US industrial base is larger than that found in the UK, some potentially competitive US companies will not be able to compete because they were unable to find a UK partner. Those excluded from the program can be expected to lobby against the cooperative program in Congress.

SUMMARY

Cooperative development programs must compete for funding in both the UK and the US. When funding cooperative programs, officials must fight the tendency to compare the cooperative development effort against similar national programs. This requires a real knowledge of the costs and benefits of cooperative development. This education process will be much easier in the UK where the executive branch, represented by the Secretary of State for Defence, is generally in control of the defense budget process. The horizontal budget process of the US makes the education process much more difficult. As a result, cooperative development programs may find it difficult to compete against national development efforts in the US.

Chapter Six

SUMMARY AND RECOMMENDATIONS

SUMMARY

It is hoped the reader has reached this point with the impression that cooperative development programs are not easy. However, cooperative development programs can work. Each nation participating in a cooperative effort must be aware of its own problems and the problems of the other nation. Success will be the result of long-term efforts on the part of both governments to make cooperation happen.

Operational requirements are crucial to the success of cooperative development programs because no one is interested in cooperation for the sake of cooperation. Both countries must agree on the military requirement before the program even begins. More importantly, each must recognize that hard decisions will come, and trade-offs must be made as the development proceeds.

After operational requirements, technology transfer policy could be the biggest difficulty facing cooperative development. Differences in technology transfer policy cause friction between the cooperating parties. Issues such as technology availability, third party sales, unauthorized use/disclosure, and the protection of national industrial rights can cause disagreement between the participants.

While similar, the acquisition processes of the UK and the US are not identical. Those responsible for oversight must understand the differences between the two processes. Phase point mismatch and phase content are the two most significant differences. By understanding both processes, the participants will be able to understand the information requirements of the other.

Cooperative programs must compete for funding in both countries. Officials must understand the costs and benefits of cooperative development. The education process for the UK is relatively simple because one individual is in charge of the budget process. In the US, this problem is more difficult because authority in the budget process is distributed between the executive and legislative branches.

ANALYSIS AND RECOMMENDATIONS

Cooperative development programs will require active participation by senior defense officials in both countries. Taken in isolation, none of the difficulties highlighted in this paper are insurmountable. However, resolution of many problems are beyond the authority of the program manager. Timely resolution of difficulties will be necessary.

RECOMMENDATION 1. Cooperative programs should not be allowed to proliferate. Participation should be limited to one or two projects per US service. This will allow senior defense officials to provide timely input to the resolution of difficulties as they arise.

Operational requirements are crucial to cooperative development programs. Disagreements must be settled quickly at the level necessary to resolve the differences. Requirements personnel must monitor a cooperative program very closely to ensure they can live with the trade-off decisions being made at the international program office.

RECOMMENDATION 2. A solid operational requirement must be the first criteria against which participation in any cooperative program is judged. Requirements personnel from both countries should meet at the program office every six months to review trade-off decisions made by the program office. Problems should be pushed up the chain-of-command immediately. If agreement of the requirement cannot be maintained, the cooperative program should be terminated.

Cooperative development programs are not an appropriate arena in which to resolve differences in technology transfer policy. Disagreement will only slow the program down and ultimately threaten its survival. Both countries must decide what technology will be made available to the program, and what restrictions apply to the release of that technology. Each must determine the likely performance of the system based upon technology availability, and whether that performance is acceptable to them.

RECOMMENDATION 3. A formal agreement on the technology each country will make available to the program and the conditions placed upon its use should be signed before cooperative development begins. If the requirement cannot be met using the technology available, the development should not be undertaken.

RECOMMENDATION 4. Initially, cooperative development efforts should not push state-of-the-art technology limits.

Cooperative development projects should not attempt to adapt to the acquisition processes of both countries. An acquisition strategy should be agreed upon before cooperative development begins. It would appear to be easier for the UK to adapt to the US system because fewer people must be educated.

RECOMMENDATION 5. Cooperative programs should use an acquisition strategy based upon the recommendations of the Packard Commission. Early competitive prototyping will allow both nations to determine quickly if the system will meet military requirements.

In the UK, program funding is relatively assured once the program is approved. However, the cooperative development program must compete yearly for funding in the US. For this reason, the following recommendations are tailored to make a long-term commitment to the program as easy as possible for the US.

RECOMMENDATION 6. Initially, cooperative development programs should be for relatively simple, inexpensive systems. Tactical A/S weapons systems are ideally suited to this constraint. Low cost will attract minimal Congressional attention during the budget review process, keep industry lobby efforts low key, and make service participation less painful.

RECOMMENDATION 7. Cooperative development programs should not develop systems which are critically important to the national defense of either country.

RECOMMENDATION 8. Initial cooperative development efforts must be successful and timely.

The final recommendation is most important to the future of cooperative development in the US. The US has never participated in a successful cooperative development program. Some feel cooperative development adds difficulty to an already difficult task. If the first cooperative development projects are allowed to flounder in the difficulties cited, there may not be a second chance. On the other hand, progress will reduce the difficulties for future cooperative programs as each participant learns how to cooperate more effectively. Also, successful development will change potential benefits into real benefits. Once the military

and political leaders can actually see the benefits of cooperative development, cooperation can begin on more expensive and critical systems.

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